

Field lessons in surveying healthcare waste management activities in Pakistan

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Abstract

Background: Developing countries face difficulties in implementing safe healthcare waste management (HWM) practices. It is important to holistically probe the ground situation to meet this challenge.

Methods: In this study we surveyed 12 public and private hospitals in a major city of Pakistan, Gujranwala. The survey consisted of waste characterization as well as targeted interviews using standardized questionnaires.

Results: The results indicated issues including lack of waste segregation, lack of sufficient knowledge & awareness regarding HWM and a high prevalence of Hepatitis C among hospital housekeeping staff. We also discovered that organizational and administrative solutions for effective HWM are as important as preventive monitoring and control.

Conclusions: Apart from technical improvement, behavioral changes are vital for a positive change regarding HWM. Overall, this study led to an increased awareness of public health issues related to HWM that had hitherto gone unnoticed by hospital staff as well as relevant public authorities in the city.

Keywords: hospital waste, waste management, developing country, sanitation, behaviour.

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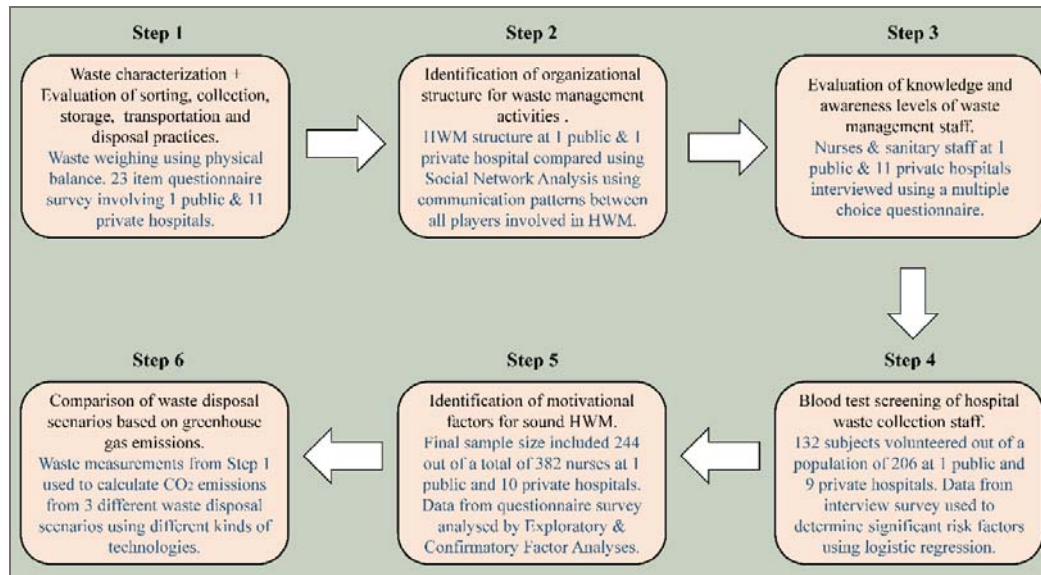
Introduction

Healthcare waste management (HWM) is a serious challenge in many low- and middle-income countries, where infectious medical waste from hospitals is usually discarded in vacant plots or open dumping grounds, which are visited by substance users, stray animals and scavengers resulting in additional public health concerns (1). Pakistan is a resource-constrained country in South Asia and many of its cities have experienced rapid urbanization over the last few decades, while the public health infrastructure has not seen a proportionate growth (2). Consequently, hospitals in many of the cities in the country lack proper medical waste disposal systems such as incinerators or sanitary landfills. Thus, it is important to explore the current HWM practices, report shortcomings and take remedial action. Currently, there is a shortage of scientific literature regarding compliance with HWM regulations in public or private healthcare institutions and the few existing studies point towards serious deficiencies in HWM across the surveyed establishments (3,4). To fill this gap, we conducted a survey at the public and private hospitals in Gujranwala, which is the fifth largest city of Pakistan with an estimated population of more than 2 million and an annual growth rate of 3.49% (5). Its reputation as one of the most polluted cities in Asia (6) and the fact that it is the fastest growing city in the country (3) makes it necessary to assess the status of HWM at its hospitals.

Methods

This was a 6-part study consisting of a holistic evaluation of HWM practices at the studied hospitals covering environmental, epidemiological and organizational aspects of HWM at the surveyed hospitals as shown in Figure 1. There was only one public hospital in the city (449 beds). In addition, there were 35 private hospitals consisting of 5 philanthropic hospitals (75–250 beds) and 30 small for-profit hospitals (7–55 beds) in the predominantly urban counties of the city. The survey was conducted between September 2014 and March 2015.

Figure 1. Description of the survey process.



Identification of key challenges for effective hospital waste management

In the first step the methodology for data collection consisted of physical segregation and weighing of hospital wastes for 7 days, along with the determination of waste management practices using a standard questionnaire. The questionnaire was developed in accordance with national regulations on HWM and addressed to hospital managers. We discovered that waste segregation, collection, storage, transportation and disposal practices at all hospitals had serious shortcomings. Prominent issues included lack of proper source segregation of waste into medical and general waste fractions, lack of a dedicated route for transferring infectious waste items, lack of colour coded bags to distinguish between risk and non-risk waste items, storage of sharp items in thin paper boxes that could be easily pricked, and lack of safety equipment for the waste handling staff at all hospitals (3).

For a root cause analysis of these shortcomings we probed the organizational structure of HWM at two representative public and private hospitals using Social Network Analysis (7). This analysis clearly identified shortcomings such as communication gaps between different actors in the waste management network at the surveyed hospitals which were contributing to poor HWM practices. For instance, hospital management teams were weakly linked with a commercial firm to which pathological waste disposal was outsourced. This firm collected medical wastes from different hospitals in the city and carried them to an incinerator located 119 km away in another city, which resulted in environmental emissions and financial costs for the hospital.

An additional advantage of the social network analysis included identification of key players in the waste management network at the surveyed hospitals on the basis of the strength of their ties to other members as per their daily communication among each other. These key players could be used for effectively disseminating necessary information, directions and knowledge regarding HWM which was quite important considering the fact that only 37.5% of the sanitary workers at the private hospitals and merely 31.8% of the sanitary workers at the public hospital reported receiving regular trainings on HWM (8).

The information needs assessment of the hospital staff regarding safe HWM practices was determined using a multiple choice questionnaire directed towards nurses and hospital housekeeping staff as they were at the forefront for waste segregation and collection. The results showed that the percentage of correct answers for nurses and housekeeping staff at the private hospitals was 52.5% and 30.2% respectively whereas at the public hospital it was 69.2% and 47.9% respectively (8). These results stressed the need for training and education for hospital staff to ensure better HWM practices. This was especially important in terms of safety and hygiene of the hospital housekeeping staff a majority of whom did not have proper safety equipment which exposed them to the danger of acquiring infectious diseases (3). To determine the impact of the lack of safety equipment, we screened 132 out of a total population of 206 housekeeping staff at all hospitals included in the survey for HCV and HBV. HCV is a major cause of concern accounting for a prevalence of 6.5% among the general population in the city (9). Rapid testing kits were purchased and provided to the relevant lab staff at each hospital for the tests. In many cases the hospitals double-checked the results using their own kits, equipment or methods such as ELISA. No change in results was observed in any case as a result of this cross verification. In the end, 18 (13.63%) of the subjects returned positive results for HCV and accidental needle pricking was discovered as a significant risk factor after regression analysis (10). None of the cases tested positive for HBV. The results are in line with the trend in the country having the second highest cases of HCV in the world (4.8%) while those of HBV are significantly fewer (2.5%) (9). Thus, poor waste management practices were taking a toll on the health of the hospital staff which called for the need of an immediate remedial action.

Identification of solutions for effective hospital waste management

Since Pakistan is a resource-constrained country it does not have the financial or technical solutions that can be employed on a sustainable basis for the implementation of sound HWM practices. In view of this we used Exploratory and Confirmatory Factor Analyses to discover motivational or behavioural factors that might lead to an improvement in HWM practices. We discovered that non-economic

motivating factors can also influence sound hospital waste management (11). Incentives to adopt sound HWM practices include concerns about the reputation of a facility and an apprehension of liability accruing from poor HWM practice whereas concerns about financial costs and perceived over-burden on staff act as disincentives for the implementation of sound HWM. These factors can be used to devise a strategy that can be enforced with the help of the key players identified in the organizational analysis in the second part shown in Figure 1.

To reduce the environmental cost of hospital waste disposal we evaluated three different waste disposal scenarios and discovered that an integrated waste disposal system consisting of incineration, composting and material recycling as the best option (12). However, the effectiveness of such a system was dependent primarily on proper waste segregation into risk and non-risk waste types which in turn was dependent on proper training of the hospital housekeeping and nursing staffs as discussed earlier. Thus, all of the issues and solutions discovered during our survey were interconnected and needed to be resolved simultaneously.

Results

Table I. Summary of results of all the steps given in Figure 1.

Step	1	2	3	4	5	6
Quantitative results	Weighted average waste generation rate of 0.667 Kg/bed per day.	Average communication path lengths of 3.07 and 1.02 at the large and small hospitals respectively.	Ratio of trained sanitary workers at public and private hospitals was 31.5% and 37.8% respectively.	13.6% of the subjects tested positive for HCV. Needle pricking identified as a significant factor.	Hypotheses validated through EFA-CFA cross verification.	Integrated waste management system resulted in minimum net emissions i.e. 35.98 Kg CO ₂ equivalent per tonne of waste.
Qualitative results	Poor waste storage, segregation	Feedback gaps between waste	Hospital waste management	Variations existed across	Concerns about hospital reputation	Waste minimization and source

	on and storage practices observed.	collectors and hospital management were observed.	efficiency and performance grew in tandem with staff trainings.	hospitals in different towns of the city pointing towards differences in HWM plan adoption and execution.	n, fear of liability and expenses act as motivational factors for sound HWM.	segregation are essential to realize an integrated and efficient hospital waste disposal plan.
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The issues and solutions probed during the survey were duly conveyed to the hospital managers for remedial action. The concerned hospital managers promised to take action against negligent staff, improve segregation procedures and improve the safety provisions for their housekeeping staff. Subsequent monitoring at the private hospitals was constrained as hospital managers were reluctant to allow re-evaluation of HWM practices. Thus we monitored the public hospital and sadly we re-witnessed hospital housekeeping staff throwing pathological waste along with general waste, most of them still without proper safety equipment.

Discussion

This survey taught us several practical lessons many of which were as important as the challenges and solutions described above.

1. We discovered that some of the hospital staff were involved in illegal sale of medical as well as general waste items and they did not want us to monitor their activities. Due to fear of liability among the concerned hospital staff it was quite challenging to probe and monitor HWM.
2. Informal political groupings existed among staff at larger hospitals and they often competed for influence. Conducting a survey depended on gaining and maintaining the confidence of the prominent groups within the hospital administration.
3. The patients, visitors and the general public in the vicinity of the hospital were either oblivious or indifferent towards the issue of hospital waste disposal. The general waste container of most hospitals was located on busy road cross-sections with many food stalls and canteens located nearby. However,

no-one seemed to pay heed to blood stained waste lying around the container or the presence of stray animals. This points towards a general apathy of the public towards safety and hygiene; thus, indicating the need for disseminating public health awareness and education among the public at large.

4. There were many scavengers involved in waste sorting and collection at the hospitals and in some cases they were operating under the explicit knowledge or in concert with some staff members at the hospitals. Most of these scavengers were children belonging to the Afghan refugee community and they were operating without any safety equipment. This represented legal as well as public health concerns that require stronger monitoring by the relevant government departments.
5. Some of the hospital managers cancelled HCV testing as soon as positive results started appearing. Overall, most of the administrative staff at the hospitals seemed careless about the issue of safety equipment for hospital housekeeping staff, and since a majority of the latter belonged to the marginalized Christian community this represented another human rights issue (13).

Conclusions

The situation of HWM needs to be significantly improved at the studied hospitals. In view of the resource constrained environment of the city we propose a focus on waste minimization and effective segregation as well as installation of effective waste disposal technology and information systems as implemented in developed countries (1). The most practical solution is to involve the local community leaders in effecting a positive change. Such opinion leaders include political office bearers as well as the religious and tribal leaders in the city who may stress religious and cultural themes of cleanliness (14) to instigate a behavioural change towards HWM in a conservative society such as Pakistan. Finally, there is an urgent need to change the way healthcare establishments look at their own staff rights and responsibilities for an improvement in their standard of living.

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